THE IMPORTATION OF TYPHUS FEVER INTO THE UNITED STATES*

J. L. KANTOR

Syracuse, N. Y.

It is not unreasonable to suppose that the present European conflict will give rise to a typhus visitation of this country similar to that which followed the recent Balkan war.[1] Altho the writer does not believe that typhus fever can make any appreciable headway amongst a people who are in general free from vermin infestation, it is well to know exactly what we might have to face; hence, a little closer study of the data available in this connection does not seem untimely.

Typhus fever being endemic and epidemic in Europe and Africa, Asia, and Mexico, this country is theoretically exposed on three sides to primary sources of infection. Importation across the Pacific is not very imminent so long as the exclusion of oriental labor remains a national policy, and so far as the writer knows, no cases are on record as having been introduced from this direction. Importation from Mexico, which was feared by Wilder,[2] has actually come to pass: the recent Mexican rebellions have been responsible for several scattered cases in the Southwest, and for a small epidemic among our New Mexico Indians.[3] Importation across the Atlantic, however, possesses the greatest epidemiologic interest. While it is theoretically true that "the period of incubation of typhus fever is of sufficient duration to allow an immigrant to take passage after infection and reach a United States port without showing evidence of the disease,"[4] it must nevertheless be borne in mind for practical purposes that no cases have been imported on ocean "greyhounds" and that the average typhus-bearing ship crosses the Atlantic in about 2 weeks. When it is further considered that the incubation period in man is usually estimated at from 7 to 14 days, and probably does not exceed 21 days (Wilder), it must be admitted that the great majority of persons

* Received for publication July 27, 1915.

1. U. S. Pub. Health Rep., 1914, 29, p. 677. Ann. Rep. Health Officer Port of New York, 1914, 5, p. 66.
2. Jour. Infect. Dis., 1911, 9, p. 97.
3. U. S. Pub. Health Rep., 1911, 26, p. 1112; 1914, 29, p. 1068. Day: New Mex. Med. Jour., 1914, 12, p. 45.
4. U. S. Pub. Health Rep., 1914, 29, p. 677.

directly infected in Europe will have developed the disease sufficiently during transit to be readily recognized, on their arrival in this country, as cases of typhus fever. Moreover, if we adhere to the practice of quarantining the steerage passengers of such typhus ships until the maximal incubation period is over (as was done by O'Connell in New York), the danger of admitting cases of typhus infected in Europe will be reduced to a minimum.

However, there seems to be increasing evidence that not all cases of typhus imported into this country were infected before taking passage, and that the quarantining of incoming patients and of their contacts will not prevent the continued introduction of certain sporadic cases and their dissemination throughout the country. In fact, the question of the rôle played by immune carriers of typhus lice and the mechanism of typhus importation by such individuals does not seem to have attracted much attention in discussions of the subject. The main features in this connection may be well brought out by study of an illustrative case, such as the writer had the opportunity of making in the person of a Macedonian immigrant.[5] The man arrived at East Syracuse March 24, 1915, remained well until April 7, when he began to complain of mild prodromal symptoms, and came down acutely on April 9. From then on, until defervescence on April 19, he ran the typical course of typhus fever, terminating in recovery. The clinical diagnosis was confirmed by a strongly positive reaction of agglutination. (All the immunity tests referred to in this study were made by Dr. Harry Plotz and Dr. Peter K. Olitsky, of the Mount Sinai Hospital, New York City.)

An inquiry into the recent history of this patient brought out some interesting features. He had made three previous visits to America, working as a common laborer in different cities, and returning each time to his home near Florina, Province of Monastir, European Turkey. According to his statement, there was no typhus fever at or near Florina during his last visit. His return to this country may be presented in tabular form as follows:

Left Florina by rail	March	1, a. m.
Arr. Salonika	March	1, p. m.
Left Salonika by packet	March	2

5. The clinical features of this case are discussed by Levy and Kantor: Boston Med. and Surg., 1915, 73, p. 473.

Arr. Piraeus .....March 3
Left Piraeus by S. S. "Patris"....March 3
Left Kalamata .....March 4
Left Patras .....March 5
Left Algiers .....March 10
Arr. New York .....March 23, a. m.
Left New York by rail.....March 23, p. m.
Arr. E. Syracuse .....March 24

The itinerary of the "Patris" was confirmed by Dr. J. J. O'Connell, health officer of the Port of New York, who further reports that there was no typhus notified at the ports of call on the dates mentioned. At Salonika, however, there were 6 fatal cases of the disease during the two weeks following February 21.[6]

According to the patient's story, he was free from vermin until he boarded the packet at Salonika. Both that ship and the "Patris" were apparently in poor sanitary condition, for by the time the latter arrived in New York many of the steerage passengers harbored body lice. As already mentioned, the subject did not show any symptoms of the disease until April 7. Since he took pains to destroy his infected clothing immediately upon his arrival at East Syracuse, the basis for contagion was eliminated, and no secondary cases developed.

Two strikingly similar cases[7] occurred in Massachusetts. The immigrants arrived at Boston on April 23, 1914. One of them proceeded to Graniteville, where he was taken ill with typhus on May 8. The other went to Quincy, where he came down with typhus on May 3. The S. S. "Rhaetia," on which the subjects arrived, left Hamburg on April 8 and Boulogne-sur-Mer on April 9. No sickness developed on board during the passage, and no cases of typhus were reported at either of the ports of departure (according to information submitted by Dr. F. X. Crawford, port physician, city of Boston).

A study of these cases seems to justify the following generalizations: (1) All three were isolated cases. According to available information, typhus did not exist at the ports of departure. No cases

6. U. S. Pub. Health Rep., 1915, 30, p. 1564.
7. Ibid., 1914, 29, p. 1381.

developed on shipboard. Therefore, no ordinary means of quarantine could have prevented their importation. (2) In each instance, the space of time elapsing between the date of embarkation and the development of the disease in this country exceeded the maximal incubation period; namely, 34 days in the Syracuse case, 29 days in the Graniteville case, 24 days in the Quincy case. (3) In each instance, the space of time elapsing between arrival in this country and the development of the disease fell within the incubation limits of typhus fever; namely, 2 weeks in the Syracuse and Graniteville cases, 10 days in the Quincy case. (4.) It follows, therefore, that the infections must have taken place on shipboard. However, typhus is not a ship disease any more than it is a house disease. Besides, vessels sailing from certain suspected ports are now being fumigated before their departure (as was the case with the "Patris") for the destruction of rats and other vermin. On the other hand, the acceptance as passengers of typhus carriers (i. e., immune carriers of typhus lice) is not prevented, and the conditions on shipboard in the steerage, during each voyage at least, still appear to be eminently favorable for the spread of contagion. It seems much more likely, therefore, that the infections in these cases came from lice harbored by immune fellow-passengers rather than from vermin previously existing in the vessels of passage.

Let us consider a little more closely the question of typhus carriers. It is obvious that under appropriate circumstances any typhus immune may become a typhus carrier. In order to obtain some idea as to the actual existence of such persons, tests were performed on four of the Syracuse patient's associates, all Macedonians. Altho these men were in good health and denied ever having been sick with typhus, two of them gave distinctly positive agglutination and complement-fixation. Furthermore, in their studies on typhus immunity, Plotz and his co-workers found that uninfected individuals may have a certain degree of (natural?) resistance to the disease in question. Finally, all convalescents from the endemic Brill's disease are typhus immunes. It thus appears that we have in this country a by no means negligible group of individuals who may act (or perhaps who have acted) as typhus carriers or distributers under favorable circumstances.

Of great interest in this connection is the question of American endemic typhus, or Brill's disease. A survey of the reported cases

indicates that the malady has been recognized in most of our large cities from Massachusetts to Virginia and from New York to Minnesota and that probably several hundred new cases develop annually. (Cases of Brill's disease have been reported to date from the following states: New York, Massachusetts, Pennsylvania, Maryland, Virginia, Georgia, Indiana, Illinois, Wisconsin, Minnesota, as well as from Washington, D. C.) What is the origin of this disease? What is its exact relation to the epidemic fever? Why is it so much milder in its manifestations? It seems to the writer that we are now in possession of sufficient data to offer a tentative hypothesis for the explanation of these phenomena. Perhaps some such theory as the following may stimulate further investigation and thus aid in definitely solving the problem in question:

Individuals actually sick with European typhus have never entered this country in large numbers. Only exceptionally have isolated cases been imported, and whatever small epidemics have resulted have been checked more or less promptly. On the other hand, the importation of typhus lice by immunes must have been going on ever since the establishment of communication between this country and the typhus infested districts of Europe. However, being imported by immune individuals (according to our theory), the typhus germ would be deprived of the opportunity to sustain its virulence by passage through a human host. Indeed, it might be conceived to undergo a certain degree of attenuation during its sojourn of about 2 weeks in the body of the originally infected louse or its descendants. If, now, large numbers of such attenuated germs were actually introduced into the United States in the manner suggested, might they not be expected to give rise, in susceptible individuals, to a form of mild typhus corresponding in its manifestations to Brill's disease as we know it to-day? In other words, may we not look upon American typhus simply as European typhus modified by an unusually long passage—as compared with epidemic conditions—through a non-human host?

SUMMARY

The isolation of immigrants sick with typhus fever and of their contacts, does not prevent the introduction of the disease into this country.

It is very probable that immune carriers of typhus lice, by infecting individuals on shipboard, have caused the importation of cases of epidemic typhus fever.

It is possible that Brill's disease may be the result of the introduction into this country (by immune carriers) of lice harboring attenuated typhus bacilli.

In order to prevent the further importation of all forms of typhus fever, attention should be directed not so much against individuals, as against lice,—the actual carriers and transmitters of the disease in question.